

GG-E-651C  
June 4, 1975  
SUPERSEDING  
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July 6, 1966  
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February 19, 1953

## FEDERAL SPECIFICATION

### ERASER, BLACKBOARD

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

#### 1. SCOPE

1.1 This specification covers one type of blackboard eraser primarily intended for erasing chalk marks from blackboards and chalkboards.

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

##### Federal Specifications:

V-T-276 - Thread; Cotton.  
PPP-B-566 - Boxes, Folding, Paperboard.  
PPP-B-636 - Boxes, Shipping, Fiberboard.  
PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple-Wall.  
PPP-B-665 - Boxes, Paperboard, Metal Edged and Components.  
PPP-B-676 - Boxes, Setup.

##### Federal Standards:

Fed. Std. No. 123 - Marking for Shipment (Civil Agencies).  
Fed. Std. No. 191 - Textile Test Methods.  
Fed. Std. No. 751 - Stitches, Seams, and Stitching.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.)

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

##### Military Specifications:

MIL-P-116 - Preservation-Packaging, Methods of.

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Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.  
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Federal Trade Commission Publication:

16 CFR 300 - Rules and Regulations under the Wool Products Labeling Act.

(Application for copies should be addressed to the Federal Trade Commission, Washington, DC 20580.)

2.2 Other publications. The following documents forms a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Association, Inc., Tariff Order Section, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Materials.

3.1.1 Felt. See tables I and II for composition and physical requirements of the felt.

3.1.1.1 Wool. The wool fibers used in the felt shall be fleece, pulled wool, wool noil, reprocessed wool, reused wool, or any combination thereof.

3.1.1.2 Other fibers. Fibers used in the fabrication of the felt, other than wool, may be of vegetable or synthetic origin.

3.2 Design and construction. The overall eraser dimensions shall be not less than 5 x 2 x 1-1/4 inches. The felt strips shall be securely fastened to the backing felt by stitching or by adhesive-bonding. The erasing felt for the stitched eraser shall consist of 4 filler strips and 2 side strips, each strip to be not less than 5 inches long, 1 inch deep, and 5/16 inch thick. The filler strips shall be designed from two felt strips, cut double width, folded once, and securely stitched to the back so that they are flush with, or not more than 1/8 inch from each edge of the backing. The erasing felt for adhesive bonded erasers shall consist of six filler strips, each strip to be not less than 5 inches long, 1 inch deep, and 5/16 inch thick. Each of the 6 filler strips shall be securely bonded by adhesive to the backing felt in such a manner that the outside filler strips are flush with, or not more than 1/8 inch from each edge of the backing.

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3.2.1 Thread. The thread used in stitching shall be ticket No. 16, 4-ply, of type IA or IB in accordance with V-T-276.

3.2.2 Stitching. The stitching shall be not less than 5 stitches to the inch, and shall be stitch type 301 or 401 in accordance with Fed. Std. No. 751.

3.2.3 Adhesive. The adhesive shall be of a type to maintain a secure bond in an atmospheric condition of 100° F. (38° C.) and 85 percent relative humidity for a minimum of 48 hours.

3.2.4 Adhesive bonding. Each of the 6 filler strips shall be securely bonded by adhesive to the backing felt throughout its entire length.

3.3 Composition of felt. The composition of finished felts shall be in accordance with table I.

TABLE I. Composition of felts (percentages)

Properties	Eraser felt	Backing felt	Test paragraph
Carbon tetrachloride-soluble matter (max.)	4.0	3.0	4.2.3.3
Sizing content (max.)	15.0	28.0	4.2.3.4
Wool content (min.) <sup>1</sup>	50.0	60.0	4.2.3.5
Ash (max.)	4.0	3.0	4.2.3.6

1/ The wool fiber content as determined in 4.2.3.5 indicates the percentage of wool by chemical analysis and is exclusive of other fibrous materials of vegetable and synthetic origin which can be up the remainder of the felt composition.

3.4 Physical requirements of felt. Physical requirements of the finished felts shall be in accordance with table II.

TABLE II. Physical requirements of felts

Properties	Eraser felt	Backing felt	Test paragraph
Thickness (inches)			
Nominal	5/16	1/4	
Minimum	0.284	0.232	4.2.3.1
Maximum	0.342	0.268	
Weight (lb./sq. yd.)			
Minimum	2.45	2.90	
Maximum	3.28	4.18	4.2.3.2
Minimum tensile strength (lb./sq. in.)	75	250	4.2.3.7
Minimum splitting resistance (lb./2 in. width)	2	12	4.2.3.8

3.5 Color. Unless otherwise specified (see 6.2), the erasers shall be gray.

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3.6 Identification marking. Each finished eraser shall be equipped with paper, or other suitable material, secured to the backing felt and marked with manufacturer's name or trademark.

3.7 Workmanship. The finished erasers shall be free from frayed edges, tears, cuts, holes, thin areas, wrinkles, creases, naps, waves, lumps, discoloration, jagged or irregular edges, distortion, extraneous foreign matter, or any other defect which affects their appearance, may affect their serviceability, or may cause damage to blackboard and chalkboard surfaces. Adhesive-bonded erasers shall be free of surplus adhesive on the side and the ends of the erasers. The erasers shall be free of warp, longitudinally and laterally.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.1.1 Felt. The supplier shall retain at least 576 square inches of each type felt used in the manufacture of the erasers, to be furnished when requested for testing by the contracting officer (see 6.2). The felt pieces shall be from the same lot of felt used in manufacturing the erasers offered for acceptance.

#### 4.2 Sampling and inspection.

4.2.1 Inspection of end item. Sample erasers shall be examined for defects listed in table III. Sampling shall be performed in accordance with MIL-STD-105. The inspection level shall be S-3 with an acceptable quality level (AQL) of 4.0 defects per hundred units. The sample unit shall be one eraser. The lot size shall be all erasers offered for acceptance at one time.

TABLE III. Inspection for eraser defects

Examine	Defects
Materials	Eraser not of felt material.
Design and construction	<p>Sewn eraser not complete with 4 filler strips and 2 side strips, or adhesive-bonded eraser not complete with 6 filler strips in eraser face; not equipped with a one-piece backing felt.</p> <p>Sewn felt strips not securely stitched to the backing, or adhesive-bonded erasers not securely bonded to backing.</p> <p>Dimensions not as specified.</p> <p>Sewn eraser stitching not less than 5 stitches to the inch, or incomplete bonding on adhesive-bonded erasers.</p>
Identification marking	Not as specified in 3.6.
Workmanship	Not as specified in 3.7.

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4.2.2 Inspection of preparation for delivery. An inspection shall be made to determine that the packaging, packing, and marking comply with the requirements of section 5. Defects shall be scored in accordance with table IV. For examination of interior packaging the sample unit shall be one shipping container fully prepared for delivery, selected at random just prior to the closing operations. Sampling shall be in accordance with MIL-STD-105. Defects of closure listed shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 with an AQL of 4.0 defects per hundred units.

TABLE IV. Inspection for preparation for delivery defects

Examine	Defects
Markings (exterior and interior)	Omitted; incorrect; illegible; improper size, location, sequence, or method of application.
Materials	Any component missing or damaged.
Workmanship	Inadequate application of components such as incomplete closure of container flaps, loose strapping, or distortion of container.
Contents (exterior and interior container)	Number per container is more or less than required. Net weight exceeds requirements.

4.2.3 Tests. Sample felt specimens, selected at random from different portions of the rolls or sheets of each type felt used in manufacturing the erasers, shall be subjected to the following tests. Sampling and testing shall be performed on each type felt used. Each sample shall consist of not less than 576 square inches of material. The lot and sample size shall be as indicated in table V. Failure of one or more samples to pass any test shall be cause for rejection of the lot of erasers.

TABLE V. Lot and sample sizes for felts

Lot size (yards)	Sample size
800 or less	2
801 to 22,000	3
22,001 and over	5

4.2.3.1 Thickness.

4.2.3.1.1 Apparatus. The thickness shall be measured by a dial micrometer consisting of an anvil, with a minimum diameter of 2 inches, for supporting the specimen; a circular presser foot having an area of  $1 \pm 0.0025$  square inch (1.129 inches in diameter) acting under a dead weight load of  $10 \pm 0.5$  ounces; and a dial graduated to read directly in thousandths of an inch. The anvil shall have a flat horizontal surface, and in measuring large pieces of felt the anvil shall be in the same plane as the supporting table. The presser foot shall be of sufficient thickness to insure rigidity and the edges shall be rounded off with a radius of  $0.016 \pm 0.001$  inch. The surfaces of the presser foot and anvil shall be parallel to within 0.001 inch. Less than 0.5 ounce shall be required to overcome friction and to produce perceptible motion of the presser foot when counterbalanced. The load shall be applied gradually and without shock.

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4.2.3.1.2 Procedure. Cut 3 representative specimens, each containing not less than 40 square inches, from different portions of the felt samples. Take the thickness readings from 10 to 15 seconds after the load is applied. Take 5 thickness determinations on each specimen, average the thickness determinations of the 3 specimens to the nearest 0.001 inch, and check for compliance with table II (see 3.4).

4.2.3.2 Weight. Each of the 3 specimens from 4.2.3.1, while in standard condition, shall be accurately measured and then weighed on a balance sensitive to 0.1 percent of the total weight. Calculate the weight of each specimen in pounds per square yard and average the 3 determinations to the nearest 0.01 lb./sq. yd. Check the average for compliance with table II.

4.2.3.3 Matter soluble in carbon tetrachloride. Take a total of approximately 5 grams of felt in equal quantities from the specimens in 4.2.3.2 and cut into pieces approximately 1/8 inch square. Dry the specimens to a constant weight at 105° to 110° C. (221° to 230° F.) and record the weight as "B." This is the weight of the original oven-dried specimen. Then extract the specimen with carbon tetrachloride, in a soxhlet apparatus for 4 hours, with a minimum of 20 siphonings. Evaporate the carbon tetrachloride from the extract and dry the residue to a constant weight at 105° to 110° C. This is the weight of the matter soluble in carbon tetrachloride and shall be reported as a percentage of the original oven-dried specimen "B." Check the percentage for compliance with table I (see 3.3).

#### 4.2.3.4 Sizing content.

4.2.3.4.1 Reagent. The Millon's reagent used in this test shall be prepared by adding 25 grams (17.6 ml.) concentrated nitric acid (sp. gr. 1.42) to 25 grams (1.84 ml.) of mercury under a hood. Upon completion of the reaction, the solution shall be diluted by adding an equal volume of distilled water.

4.2.3.4.2 Procedure. Dry the fibrous-residue specimen from 4.2.3.3 to a constant weight at 105° to 110° C. and record the weight at "F." Immerse the specimen in an aqueous solution of an amylolytic and proteolytic enzyme of a concentration and temperature recommended by the manufacturers for the necessary time to remove the finishes. Remove the specimen from the enzyme solution on a stainless steel sieve or equivalent, 80 to 100 mesh. Squeeze the specimen and rinse free of the enzyme solution by alternately squeezing and rinsing in 12 successive baths of hot distilled water. Spot-test the specimen for the presence of starch with an iodine and water solution. Spot-test for protein with Millon's reagent. The presence of starch is indicated by a blue coloration and the presence of protein by a red coloration. If either test is positive, repeat the enzyme treatment for successive 1-hour periods until the spot tests are negative. After the specimen is free of the enzyme solution, dry to a constant weight at 105° to 110° C. This is the weight of the desized specimen to be recorded as "S." Compute the sizing content as a percentage of the original oven-dried specimen from the following formula:

$$\text{Sizing content} = \frac{F - S}{B} \times 100$$

where:

F = weight of specimen before desizing.

S = weight of desized specimen.

B = weight of original oven-dried specimen (4.2.3.3).

Check the sizing content percentage for compliance with table I.

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4.2.3.5 Wool content. Place the desized specimen from 4.2.3.4 in an Erlenmeyer flask and cover with 105 to 150 milliliters of a 5 percent solution of sodium hydroxide. Attach a reflux condenser and boil the solution for 20 minutes. Collect the undissolved fibers in a Gooch filter, or a 100 mesh wire screen, and wash with distilled water until neutral to litmus paper. Dry the residual fibers to a constant weight at 105° to 110° C. and record the weight as "V." Compute the wool content as a percentage of the original oven-dried specimen from the following formula:

$$\text{Wool content} = \frac{100}{B} (S - \frac{V}{.95})$$

where:

B = weight of original oven-dried specimen (4.2.3.3).

V = weight of vegetable residue.

S = weight of desized specimen (4.2.3.4.2).

(The above formula is based on the assumption that 5 percent of the cotton will be dissolved by the sodium hydroxide solution.)

Check the percentage of wool content for compliance with table I.

4.2.3.6 Ash. Take a total of approximately 3 grams of felt in equal quantities from the specimens in 4.2.3.2 and cut into pieces approximately 1/8 inch square. Dry the specimens to a constant weight at 105° to 110° C., cool in a desiccator, and record the weight as "D." Put the specimens in a tared crucible, place in a muffle furnace, and raise the temperature slowly to 800° to 1000° C. (1472° to 1832° F.), taking care to avoid loss of ash by quick ignition or by subjecting the specimen to strong drafts. When all organic matter has been burned off, cool in a desiccator and weigh. Repeat the igniting and subsequent cooling until a constant weight of ash is recorded. Report the weight as a percentage of the dried specimen "D" and check the percentage for compliance with table I.

4.2.3.7 Tensile strength. Perform this test in accordance with Fed. Std. No. 191, test method 1.1, except the test specimens shall be eight 2 x 6 inch pieces cut with a die, four lengthwise and four crosswise of the sample felt. The jaws of the clamps shall be not less than 2 inches in width. Measure the thickness and calculate the cross-sectional area of each specimen before testing. Determine the tensile strength by dividing the breaking load by the cross-sectional area. Average the 4 lengthwise determinations and the 4 crosswise determinations separately to the nearest pound per square inch and check both averages for compliance with table II (see 3.4).

4.2.3.8 Splitting resistance. Die-cut eight 2 x 6 inch specimens from the sample felt, taking four lengthwise and four crosswise of the piece. With a knife, cut each specimen within the middle third of the thickness for a distance of approximately 2 inches from one end. Then clamp the lips of the felt in the jaws of the machine used in 4.2.3.7. Record the splitting strength as the load in pounds necessary to pull the 2 sections of felt completely apart. Average the 4 lengthwise determinations and the 4 crosswise determinations separately and report the 2 averages to the nearest pound per 2 inch width. Check both results for compliance with table II.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A, B, or C, as specified (see 6.2).

5.1.1 Level A. Twelve erasers shall be wrapped together in plastic material and sealed, or unit packaged in accordance with method IC-2 of MIL-P-116.

5.1.2 Level B. Twelve erasers shall be wrapped together in plastic material and sealed, or unit packaged in a close-fitting box conforming to PPP-B-566, PPP-B-665, or PPP-B-676.



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5.1.3 Level C. The erasers shall be packaged to afford adequate protection against deterioration and damage during shipment from the supply source to the first receiving activity. The supplies may use his standard commercial practice when it meets this requirement.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A. Twelve unit packages of erasers shall be packed in a close-fitting box conforming to PPP-B-636, class weather-resistant or PPP-B-640, class 2, grade A. The box shall be closed and strapped in accordance with the appendix to the applicable box specification.

5.2.2 Level B. Twelve unit packages of erasers shall be packed in a close-fitting box conforming to PPP-B-636, class weather-resistant or PPP-B-640, class 2, grade A. The box shall be closed and strapped in accordance with the appendix to the applicable box specification.

5.2.3 Level C. The erasers shall be packed to insure carrier acceptance and safe delivery at destination at the lowest rates in containers complying with the rules and regulations applicable to the mode of transportation.

5.3 Marking.

5.3.1 Civil agencies. In addition to markings required by the contract or order, and the Rules and Regulations Under the Wool Products Labeling Act, the interior packages and shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.3.2 Military activities. In addition to markings required by the contract or order, and the Rules and Regulations Under the Wool Products Labeling Act, the interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Erasers covered by this specification are to be used for erasing chalk marks from blackboards and chalkboards.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Color required, if other than gray (see 3.5).
- (c) If test samples are required (see 4.1.1).
- (d) Selection of applicable level of packaging and packing, and any special marking required (see 5.1, 5.2 and 5.3).

Preparing activity:

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Civilian agencies interest:

GSA-FSS

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein. Price 30 cents each.